Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Canadian Science Advisory Secretariat (CSAS)

Proceedings Series 2016/006

Maritimes Region

Proceedings of the Regional Peer Review of Updating Offshore Ecologically and Biologically Significant Areas in the Scotian Shelf Bioregion

February 18-20, 2014, and March 24, 2014
Dartmouth, Nova Scotia

Chairpersons: Christie Whelan and Kent Smedbol
Editor: Lottie Bennett

Fisheries and Oceans Canada
Bedford Institute of Oceanography
1 Challenger Drive, PO Box 1006
Dartmouth, Nova Scotia B2Y 4A2

March 2016

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Published by:

Fisheries and Oceans Canada
Canadian Science Advisory Secretariat
200 Kent Street
Ottawa ON K1A 0E6

http://www.dfo-mpo.gc.ca/csas-sccs/
csas-sccs@dfo-mpo.gc.ca

© Her Majesty the Queen in Right of Canada, 2016
ISSN 1701-1280

Correct citation for this publication:

DFO. 2016. Proceedings of the Regional Peer Review of Updating Offshore Ecologically and Biologically Significant Areas in the Scotian Shelf Bioregion; February 18-20, 2014, and March 24, 2014. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2016/006.

TABLE OF CONTENTS

SUMMARY IV

SOMMAIRE V

INTRODUCTION 1

OFFSHORE ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS -THE SCOTIAN SHELF BIOREGION (FEBRUARY 18-20, 2014) 1

- INTRODUCTION 1
  - Meeting Objectives and Background 1
  - Corals and Sponges on the Scotian Shelf 3
  - Areas of High Biological Productivity 3
  - Critical Habitat for Endangered Species 4
  - EBSA Data Layers 5
  - Important Areas for Seabirds 6
  - Areas of High Fish and Invertebrate Diversity 7
  - Proposed Updated EBSAs 8
- CONCLUSIONS 10

OFFSHORE ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS -THE SCOTIAN SHELF BIOREGION (MARCH 24, 2014) 11

- INTRODUCTION 11
  - Assessment 11
- CONCLUSIONS 12

REFERENCES CITED 12

APPENDICES 13

- APPENDIX 1A. LIST OF PARTICIPANTS: FEBRUARY 18-20, 2014. 13
- APPENDIX 1B. LIST OF PARTICIPANTS: MARCH 24, 2014 15
- APPENDIX 2. TERMS OF REFERENCE. 16
- APPENDIX 3. AGENDA: FEBRUARY 18-20, 2014. 19

SUMMARY

A Maritimes Regional Science Advisory Process to review Updating Offshore Ecologically and Biologically Significant Areas in the Scotian Shelf Bioregion was held from February 18-20, 2014, at the Cambridge Suites Hotel, in Halifax, Nova Scotia, and was reconvened on March 24, 2014. The meeting was attended by DFO staff from Science, Resource Management, Policy and Economics, as well as non-government organizations, Aboriginal organizations and the fishing industry.

Eighteen Ecologically and Biologically Significant Areas (EBSAs) were described and delineated in the offshore component of the Scotian Shelf Bioregion. Seventeen of the EBSAs occur on the Scotian Shelf and one was identified in the deeper water beyond the slope. Notable ecological and biological features under the different DFO EBSA criteria were highlighted for each EBSA.

This proceedings report summarizes the relevant discussions and presents the key conclusions reached at the meetings. In addition, a Science Advisory Report and a Research Document resulting from the meeting will be published on the DFO Canadian Science Advisory Secretariat website.

Compte rendu de l'examen régional par les pairs de la mise à jour sur les zones d'importance écologique et biologique au large des côtes de la biorégion du plateau néo-écossais

SOMMAIRE

Un processus d'avis scientifique de la région des Maritimes visant à examiner la mise à jour sur les zones d'importance écologique et biologique au large des côtes de la biorégion du plateau néo-écossais a été lancé du 18 au 20 février 2014 à l'hôtel Cambridge Suite à Halifax (Nouvelle-Écosse) et a été repris le 24 mars 2014. Des employés de Pêches et Océans Canada issus des secteurs des sciences, de la gestion des ressources, des politiques et des services économiques, de même que des représentants d'organisations non gouvernementales, d'organisations autochtones et de l'industrie de la pêche, ont participé à la réunion.

Dix-huit zones d'importance écologique et biologique (ZIEB) ont été décrites et délimitées dans la composante extracôtière de la biorégion du plateau néo-écossais. Dix-sept ZIEB se trouvent sur le plateau néo-écossais, tandis qu'une ZIEB se trouve dans les eaux profondes au-delà du talus. D'importantes caractéristiques écologiques et biologiques ont été mises en évidence pour chaque ZIEB en fonction des différents critères de Pêches et Océans Canada concernant les ZIEB.

Le présent compte rendu résume les discussions pertinentes et présente les conclusions importantes tirées de la réunion. En outre, un avis scientifique et un document de recherche découlant de la réunion seront publiés sur le site Web du Secrétariat canadien de consultation scientifique de Pêches et Océans Canada.

INTRODUCTION

In March 2012, DFO Maritimes held a Regional Science Advisory Process (SAP) to develop initial advice on the objectives, ecological data and methods that should be considered in designing a network of Marine Protected Areas (MPAs) in the bioregion (DFO 2012). One of the recommendations was to re-evaluate the offshore Scientific Expert Opinion (SEO) EBSAs described by Doherty and Horsman (2007). Updating Ecologically and Biologically Significant Areas (EBSAs) is a specific deliverable for Maritimes Region under the Health of the Oceans (HOTO) initiative.

A Maritimes Regional Science Advisory Process to review and refine a list of EBSAs for the offshore component of the Scotian Shelf Bioregion was held from February 18-20, 2014, at the Cambridge Suites Hotel, in Halifax, Nova Scotia. Due to time constraints, the review was not finalized during the meeting in February. The meeting was reconvened on March 24, 2014, at the Bedford Institute of Oceanography, to complete the review and finalize the Science Advisory Report.

This proceedings report is the record of the discussion of both meetings.

OFFSHORE ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS -THE SCOTIAN SHELF BIOREGION (FEBRUARY 18-20, 2014)

INTRODUCTION

The Chairs of the meeting, C. Whelan and K. Smedbol, welcomed participants. Meeting participants introduced themselves (Appendix 1a), and the Chairs thanked them for attending the DFO Science Advisory Process to review a list of EBSAs for the offshore Scotian Shelf Bioregion.

The Chairs noted that this was a Science peer-review and advisory meeting, meaning the primary goals were to provide an objective review of the working paper to ensure information was complete, and to review the Science Advisory Report based on this information.

The Chairs provided a brief overview of the Canadian Science Advisory Secretariat (CSAS) Science Advisory Process and invited participants to review the meeting Terms of Reference (Appendix 2) and Agenda (Appendix 3a). No revisions or corrections were made to the Terms of Reference or Agenda.

To guide discussion, a Working Paper had been prepared and was distributed for review prior to the meeting.

Meeting Objectives and Background

Presentation: Updating Offshore Ecologically and Biologically Significant Areas in the Scotian Shelf Bioregion: Background, Context, and Purpose

Presenter: M. King
Rapporteurs: L. Bennett and J. Aker

Presentation Highlights

Over the past decade, DFO has made progress on identifying EBSAs in Canadian waters. In March 2012, DFO Maritimes held a SAP to develop initial advice on the objectives, ecological data and methods that should be considered in designing a network of MPAs in the bioregion. One of the recommendations from that process was to re-evaluate the offshore SEO EBSAs

described by Doherty and Horsman (2007). Updating EBSAs is a specific deliverable for Maritimes Region under the HOTO initiative. Thus, the purpose of this Regional Science Advisory Process is to update the list of EBSAs for the offshore component of the Scotian Shelf Bioregion. This process builds on the considerable work over the last decade to identify EBSAs in the offshore of the Scotian Shelf Bioregion. A range of approaches have been employed over the years, including literature review, SEO, Local Ecological Knowledge (LEK), and data-driven.

For the current process, a hybrid approach has been adopted where the SEO EBSAs described by Doherty and Horsman (2007) have been evaluated based on available regional-scale ecological data and a review of the literature. DFO and the Convention on Biological Diversity (CBD) developed separate criteria for the identification of EBSAs (DFO 2004, CBD 2009), but it is recognized that using either set of criteria will result in the identification of the same or similar areas (DFO 2012). The DFO criteria were used in the current process. The EBSAs that emerge from this process will be considered in a broad range of coastal and oceans management and planning processes in the Scotian Shelf Bioregion, including informing the design of a network of MPAs (DFO 2012).

Discussion

DFO and the CBD have developed separate criteria for the identification of EBSAs. DFO was the first organization to develop formal criteria to identify EBSAs; however, the CBD wanted to include more comprehensive criteria with intuitive language. It is generally expected that using either set of criteria will result in the identification of the same or similar areas. The DFO criteria have been used as the primary basis for identifying EBSAs in the Scotian Shelf Bioregion since this is a DFO-led process. The CBD EBSA criteria have also been considered since the updated EBSAs may be used by other federal or provincial departments, will be considered in the shared federal /provincial MPA network planning process, and may eventually be submitted to the international repository under development by the CBD.

Areas of high aggregation and diversity need to be distinguished and further clarified when being considered as criteria for the identification of EBSAs.

There was a discussion concerning the approach used to identify the proposed 19 EBSAs. Data layers considered in the identification of the proposed EBSAs were presented and reviewed. A preliminary evaluation of SEO EBSAs was conducted via an overlay analysis to determine the degree of overlap with the EBSA data layers and a literature review to identify additional EBSAs. Areas with little supporting evidence were removed from the current process.

The identification of an area as an EBSA does not grant it special legal status or automatically trigger a management response. The EBSAs and the individual EBSA data layers presented in this report will be considered in a broad range of coastal and oceans management and planning processes in the Scotian Shelf Bioregion. Each EBSA will undergo an evaluation to identify potential management needs. The evaluations, which include stakeholder consultations, will consider the nature and extent of human activities along with ecological information prior to the development of any management response.

It was questioned whether the data layers used to identify the EBSAs address all of the DFO EBSA criteria. Information on fitness consequences, for example, does not appear to be considered in the evaluation. The best available data was used in the evaluation of the EBSAs; however, gaps need to be acknowledged and additional data sources that may be available should be identified during the meeting. The identification and refining of EBSAs will be an ongoing process as new information is made available.

There was a concern regarding the use of available data. Data collected from Research Vessel (RV) surveys were used to inform the data layers for numerous fish species. It was

recommended that the stratification of the survey be reviewed and a confidence level of distribution maps be provided to ensure the species distributions are mapped appropriately.

Corals and Sponges on the Scotian Shelf

Presentation: Benthic EBSAs on the Scotian Shelf

Presenter: E. Kenchington
Rapporteurs: L. Bennett and J. Aker

Presentation Highlights

An update on mapping and coral sponge distributions in the Maritimes Regions was presented and discussed. Results of a kernel analysis of RV survey catch data, which identifies coral and sponge hotspots along the Scotian Shelf, were also presented. Distribution maps for corals and sponges were also presented along with additional maps of sand dollars and stalked tunicates and pockmarks.

Discussion

There was a discussion regarding the relationship between areas of high sponge and coral distribution and fish diversity. The relationship has been examined for vulnerable species (i.e., sponge grounds) in the area; however, this type of data is not yet available for a large number of these species. Before functional relationships of the ecosystem are examined, large aggregations of sponges and corals need to be identified and mapped.

It was noted that sensitivity to pH is of concern to many coral and sponge species. While data pertaining to bottom currents is available, pH is not. However, data concerning pH can be incorporated and analyzed post hoc.

Areas of High Biological Productivity

Presentation: Mapping Areas of High Phytoplankton Biomass in the Offshore Component of the Scotian Shelf Bioregion

Presenter: C. Fuentes-Yaco
Rapporteurs: L. Bennett and J. Aker

Presentation Highlights

The methods used to identify areas of persistent, relatively high chlorophyll concentrations and maps of those areas in the Scotian Shelf Bioregion were presented and discussed.

Areas of persistent, relatively high phytoplankton biomass in the Scotian Shelf Bioregion were characterized on the shelf and upper slope (between 100 m and 1500 m) and in the deeper water beyond the 1500 m depth. The map of the area located between the 100 m and 1500 m isobaths confirms the high biomass usually associated with shallow areas. Well-known distributions of groundfish commercially exploited in the Scotian Shelf suggest possible associations with the high phytoplankton concentration areas. In low productivity waters overlying the deeper ocean marked by the 1500 m isobath, the new map shows persistent, relatively high phytoplankton biomass along the continental slope, as defined by local deep-water climatology. The slope margin might therefore be considered an area of ecological significance that is proportionately greater than deeper waters beyond the slope. Many large carnivorous pelagic fish are caught along the margin of the continental slope seaward of the Scotian Shelf. In spite of the low absolute concentration of phytoplankton in this area, the conditions appear to sustain an important path for the migration of large pelagic fishes.

Discussion

The methods used to generate the figures and the scale of the figures indicating areas of persistent, relatively high chlorophyll concentrations in the offshore component were discussed. Ocean colour data from the National Aeronautics and Space Administration were divided into 48 quarter month periods from January to December for 2002-2012. A 10 year climatology map was generated for each segment and the data was further split into shelf and deep water. A threshold of one half a standard deviation above the mean was used to define the areas of high chlorophyll concentrations for each quarter month climatology in each sub-region. A mask was created for each climatology by assigning a value of one to all pixels above the threshold. The individual masks were then added to produce a final map for each sub-region which indicates the frequency (percentage) that each pixel had a high chlorophyll value over the 48 time segments.

The importance of connecting surface measurement with circulation patterns and benthic productivity for the identification of EBSAs, as well as, the need for a flux parameter which connects pelagic and benthic processes, was noted.

While consensus on the importance of the data and the proposed methods for use as an index was reached by meeting participants, it was suggested that the initial analysis to identify persistent, relatively high chlorophyll concentrations in the bioregion should be refined by portioning the shelf waters into eastern and western component, reflecting the well-documented differences in oceanographic environments of these areas. Separate seasonal composite layers were also recommended to account for the significant variability in chlorophyll concentrations throughout the year. It was also suggested that the deep water component of the analysis begin at the 200 m isobaths and be adjusted to include the deep waters of the Laurentian Channel.

Critical Habitat for Endangered Species

Presentation: Modelling Cetacean Distribution in the Scotian Shelf Bioregion

Presenter: H. Moors-Murphy
Rapporteurs: L. Bennett and J. Aker

Presentation Highlights

The ecological significance of fourteen of the most commonly occurring cetaceans species in the Scotian Shelf region were assigned according to criteria laid out in "the Identification of Ecologically Significant Species and Community Processes" (DFO 2006). Of the 14 species, 4 were found to fulfill all criteria, 2 of which were chosen for further analysis using Habitat Suitability Models (HSMs) based on availability of sightings data and relevant data layers; Northern Bottlenose and Sowerby's Beaked whales. Results of the modelling indicate that HSMs can provide more detailed information on species distribution on the Scotian Shelf than currently available. HSM results could be used to feed into the EBSA selection process; however, additional work needs to be completed before HSMs can be effectively used for this region.

Discussion

Once the area represented by an acoustic detection (i.e., the detection range of the acoustic recording device) is determined, it was indicated that acoustic detections could potentially be used as additional 'sightings' data.

While cetaceans sightings data dating back to the 1960s was available for use, the same 10 year time scale was used for environmental and sightings data within the model.

While the slope is considered important habitat for Northern Bottlenose whales, the HSM also indicated that areas on Sable and Western banks were important habitats. It was suggested that Northern Bottlenose whales may follow prey onto the banks. It was also suggested that this result could be driven by the level of visual survey effort in that particular area.

Participants noted that data regarding prey species is limited for some cetaceans but are an important component of the analysis that could impact results. Information on squid, for example, is likely to be an important data layer for the HSMs for Northern Bottlenose and Sowerbys Beaked whales, but the information available on squid in the Scotian Shelf region is limited and squid data layers do not currently exist.

It was suggested that seasonal habitat suitability heat maps be examined. If areas show persistent activity, they may be given further priority when considering an area for an EBSA.

The importance of cetacean sightings data collected during Canadian Wildlife Service seabird surveys was recognized.

Further development of the HSMs is required before they can be used to identify and evaluate EBSAs.

EBSA Data Layers

Presentation: Selected Data Layers Used to Evaluate EBSAs in the Scotian Shelf Bioregion

Presenter: M. King
Rapporteur: L.Bennett

Presentation Highlights

The data layers used in the evaluation and identification of EBSAs in the offshore component of the Scotian Shelf Bioregion were presented for review. The focus was placed on compiling available broad-scale data that could be used to characterize the relative distribution of species ecological or biological features or characteristics. A total of 149 ecological or biological data layers were compiled or created and mapped for this process, including areas of high fish and invertebrate diversity and biomass, areas of high chlorophyll concentration, important habitats for common fishes and invertebrates, Critical Habitats for Endangered whale species, coral and sponge occurrences, important areas for seabird functional guilds, and distinct physical conditions. Examples from each of these categories were presented.

Discussion

Data from the DFO RV survey were used to map areas of high fish and invertebrate biomass and diversity on the Scotian Shelf. For invertebrates, the initial analysis used data from 1999 to 2013. It was recommended that invertebrate data collected prior to 2007 be excluded from the analysis since the list of invertebrate species that were accurately and consistently recorded in the RV survey has expanded considerably since 2007.

Issues with how the RV survey collects data for a number of fish and invertebrate species were recognized. Species that are not adequately sampled in the RV survey include species that are deeper or shallower than the survey samples or inhabit areas that are not suitable for sampling.

The following fish species were identified as being insufficiently sampled by the RV survey: adult Atlantic Halibut, Spotted Wolffish, Cusk, Northern Wolffish, sea cucumbers, and sea stars. For species where the quality of RV survey data is considered unreliable, additional data sources should be considered. Habitat suitability maps, for example, have been produced by DFO Science for Cusk and would serve as a more accurate data layer for use in the analysis.

Participants raised concerns about the effect of temperature shifts (i.e., climate change) on invertebrates. The current analysis focuses on current condition and patterns; however, it is important to recognize that data will be updated as new trends in species distribution emerge as a result of future climatic conditions. It was suggested that the resilience of a species and the likelihood they will experience changes in habitat should be included since it is one of the DFO and CBD EBSA criteria.

The criteria used to define areas of high biomass, diversity, and important habitat for fishes and invertebrates was discussed. Areas of high biomass were identified by calculating the total biomass per tow. A continuous surface using an Inverse Distance Weighted interpolation was then created. Data layers were classified into quintiles. Areas within the top quintile (i.e., 20%) were considered areas of high biomass and important habitat. It was assumed that areas where high biomass of a particular species was consistently observed in the RV survey are important fish habitat.

Participants questioned why the top 20% quintile was used as the threshold for defining areas of high biomass and important habitat since there are no criteria or precedence for selecting the top 20% quintile. Larger areas are important when considering the resilience criteria; however, conservation targets will be determined at a later stage in the MPA network design process. It was also suggested that the areas with the highest percentages of a species during periods of low abundance be examined, as these areas could be considered core habitat for those species.

Important Areas for Seabirds

Presentation: Using Marine Birds as Indicators of Offshore EBSA Location

Presenter: K. Allard
Rapporteurs: L. Bennett and J. Aker

Presentation Highlights

Environment Canada's Canadian Wildlife Service mandate related to marine migratory birds was presented and key marine anthropogenic threats mentioned (chronic and catastrophic oil spills, seabird bycatch, and competition for key prey resources). The relative importance of marine habitat sites to migratory birds within the Scotian Shelf Bioregion was described, with emphasis on seaward coastal and offshore extensions of seabird breeding colonies, non-breeding season staging/moulting areas, non-breeding season migration corridors, and wintering areas (including those of southern hemispheric breeding species). Seabird survey data used to identify important offshore marine habitat sites for migratory birds within the bioregion were obtained from the Programme intégré de recherches sur les oiseaux pélagiques (PIROP) and the Eastern Canada Seabirds at Sea (ECSAS) databases. Survey methods were presented and the analytical approach described. Rather than areas important to individual species, areas of high relative abundance for eight seabird functional guilds were presented. This approach makes efficient use of available data and emphasizes areas of ecological importance to individual guilds composed of functionally similar species (i.e., emphasis on prey and the underlying processes that determine availability of key prey species for each guild). This is reflective of the ecosystem-based approach, consideration of marine birds as top predators in marine ecosystems and of their role as indicators of ecologically important areas associated with enduring features in the marine environment most appropriately conserved using spatial protection measures.

Discussion

It was noted that due to time constraints all eight functional guild layers were combined into one single layer for the overall overlay analysis. To reflect the different considerations for each EBSA, it was recommended that the top quintile for each functional guild be used in future analyses.

To date, additional consideration has not been given to at-risk (i.e., Threatened or Endangered) species during the analysis; however, those species have been identified in the Research Document prepared for this meeting. Additional consideration may be given in the future during the MPA planning process when management measures are being considered.

Whether looking at a single species or multiple species (i.e., a functional guild), at-sea distribution of marine migratory birds is broadly assumed to be linked to availability of prey resources. Behavioural information exists in Environment Canada datasets to verify this assumption but analyses have not yet been undertaken. For birds, EBSA criteria are being met at a minimum for aggregation, and under the previous assumption also for fitness consequences. Though possible with a single species, designation of an EBSA can be achieved with increased confidence where concentrations of species (certainly within, but also among functional guilds) overlap spatially.

Areas of High Fish and Invertebrate Diversity

Presentation: Mapping Areas of High Biodiversity in the Scotian Shelf Bioregion

Presenter: C. Ward-Paige
Proponent(s): L. Bennett and J. Kiter

Presentation Highlights

Three species-based biodiversity indices were estimated from DFO RV Survey data and presented for discussion. Analysis of species richness, the exponential of Shannon-Wiener index (ESWI) and Hulbert's Evenness index indicate that areas with high values of ESWI and Hulbert's Evenness index often occur in the same or similar locations, areas of high species richness usually occur in different areas from high values of ESWI and Hulbert's Evenness index, and the size and location of the hotspots for these biodiversity indicators change over time. There is no consistent relationship between any of these indicators and areas of high abundance of key species, and there does appear to be a strong relationship between fish species richness and ecosystem functioning, as represented by fish biomass, and some relationship between invertebrate diversity and ecosystem functioning, which need to be further explored. Further, the Bay of Fundy was consistently identified as an area with high biodiversity across indices and across time.

Discussion

The use of commercial data in the identification of EBSAs was discussed. While the RV survey is one of the most used data sets in the analyses to date, the larval survey, seabird data, invertebrate survey, and published literature are also considered. At this stage, commercial fishery data is not incorporated into the analyses because the effort is not evenly distributed, is biased toward fishing, and does not provide information on species richness. Commercial data would be considered in the future when management options for the EBSA are considered. It was noted, however, that commercial data could be useful to confirm the results of the RV Survey, identify seasonal patterns, provide data for species (e.g., pelagic species) that the RV Survey is unable to sample, and potentially help explain temporal changes between the eastern and western portions of the shelf.

The use of species richness curves should be considered when estimating species richness since the interpolation of species richness per tow does not differentiate between areas that are consistently sampling different species each tow.

Despite not being explicitly stated in the EFH criteria, areas of high species diversity should be incorporated in the EBSA delineation. It was recommended that the three diversity indices, Species Richness, Hulbert's Evenness Index, and the ESW, be used with recognition that additional work is required (i.e., data cleaning, review of species and strata) before they can be used to delineate EBSAs. Use of published species richness layers should also continue; however, additional work is required to understand the functional importance of the areas.

The data used in the analysis was restricted to the summer season and did not distinguish adult and juvenile life stages. It was suggested that future analysis consider seasonality for years where there is data for spring, summer, and fall, as well as size (i.e., the separation of adult and juvenile data).

It was suggested that future analysis should incorporate available individual Transferable Quota (ITQ) data, analyze spring, summer, and fall data over the past five year to determine the amount of shift in the polygons over time, further consider the percentile that will be used in the analysis, compare indices of diversity, species richness, and evenness with additional indicators, for example, size.

It is further suggested that for EBSA identification purposes, further research is required to explore the implications of functional diversity, both within trophic guilds or trophic levels, and across them.

Proposed Updated EBSAs

Presentation: Review of Updated EBSAs for the Offshore Component of the Scotian Shelf Bioregion

Presenters: W. King and D. Fenton
Rapporteurs: L. Bennett and J. Hoar

Presentation Highlights

Through the current process to update the offshore EBSAs of the Scotian Shelf Bioregion, the DEO EBSAs described by Doherty and Horsman (2007) were evaluated based on available regional-scale ecological data and a review of the literature. This presentation provided a short summary of each of the updated offshore EBSAs. The summaries included an explanation of the boundary (e.g., which isobaths or features were used to delineate the area) and an overview of the key ecological features found in each EBSA.

Discussion

Jordan Basin and the Gully Corridor

The use of Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Species at Risk Act (SARA) for listing species as Depleted was discussed. Because Endangered and Threatened species are specifically listed as criteria for MPA establishment under the Oceans Act and previous DFO Science advice requires the consideration of Depleted Species when identifying regional-scale Conservation Priorities, Depleted Species cannot be removed from the rational used to identify the area as an EBSA. However, reference to species of Special Concern can be removed.

It was suggested that the EBSA be included but reduced in size and the boundary adjusted to capture the key features within the southern portion of the EBSA more accurately.

Canadian Portion of Georges Bank

It recommended that the use of Georges Bank as a spawning ground for Porbeagle Shark be included in the document and analysis.

It was clarified that the boundary was expanded to include the herring spawning area in northern portion of the boundary. In addition, banks were typically defined by the 110 m isobaths; however, many important features for Georges Bank lie outside of that contour. Therefore, the majority of the boundary for this EBSA was based on the 200 m isobath.

Future analysis of this EBSA should include the RV Survey data, which due to time constraints, was not compiled for this meeting.

Northeast Channel

It is recommended that the current description of the Northeast Channel site be adjusted to include the important aspect of the fan formation in addition to presence of corals.

Browns Bank

Information concerning the aggregation criteria for scallop should be included in the document prepared for this meeting.

Roseway Basin

Removal of the reference to redfish being slow growing was suggested.

LaHave Bank

Additional information clarifying the rationale for the selection of LaHave Bank, as opposed to other nearby banks, is recommended.

Emerald Basin

While there are high concentrations of sponges on the flank of the Emerald Basin, the proposed EBSA only included the area with the highest concentrations. It was recommended that areas with high reported records of sponges be included into the EBSA. Future adjustments can be made to the EBSA boundary once data layers are reviewed.

Emerald-Western Sable Island Bank

There is less evidence of uniqueness or resilience associated with this EBSA; however, it was recommended for inclusion due to the aggregation component stemming from high fish diversity within the area.

Sable Island Shoals

It was noted that the boundary surrounding the island was arbitrary. It was suggested that data layers regarding anecdotal information or old fish surveys be removed and replaced with data regarding predator abundance. It was also recommended that the boundary be extended to incorporate the area of high primary productivity and should extend a minimum of 10 km from the island.

Eastern Scotian Shelf Canyons

There are additional species, including Pollock and Atlantic Halibut, which should be highlighted as important. Additional clarification of the unique features of the EBSA should be provided.

Middle Bank

A stronger rational for the inclusion of Middle Bank and the differences between Middle Bank and Western Bank should be included.

Canso Bank and Canso Basin

The use of Vessel Monitoring Data to confirm fishing effort in this region was recommended.

Missaine Bank

The presence of clams on Missaine Bank contributes to the uniqueness criteria and should be considered within the report.

Eastern Shoal

There were no recommendations for this EBSA.

Stone Fence and Laurentian

It was recommended this area be divided into a coral reef EBSA, and the remaining portion would become part of the Scotian Slope EBSA.

Laurentian Channel

The area surrounding St. Paul's was not eliminated from consideration but is being examined through another process (Hastings et al. 2014). It was recommended that the EBSA boundary be extended into the middle of the channel to account for the presence of sea pens, redfish, and Black Dogfish.

St. Anns Bank, Laurentian Fan Cold Seep Communities, and the Scotain Slope

There were no recommendations for these EBSAs

Scotian Slope

It was recommended this EBSA be further examined to identify smaller scale ecologically significant features within the EBSA.

CONCLUSIONS

At the end of the meeting, consensus was reached on the list of 18 EBSAs; however, additional work is required to finalize or refine several of the data layers considered in this review. The list of EBSAs will require refinement as additional information becomes available. Additional survey data should be analyzed to identify the most ecologically and biologically significant locations within these broadly defined EBSAs.

Meeting participants reached consensus on the methods used to identify areas of high persistent chlorophyll concentrations. However, the initial analysis should consider the following: splitting the shelf waters into eastern and western components due to the differences in the oceanographic environments of these areas; beginning the deep water component of the analysis at the 200 m isobath and be adjusted to include the deep waters of the Laurentian Channel; and develop separate seasonal layers to account for the significant variability in chlorophyll concentrations throughout the year. Additional work is also needed to describe the linkages between surface primary productivity and the benthos (i.e., benthic/pelagic coupling) and to understanding the horizontal transport of phytoplankton in the bioregion.

Further analysis is required to develop a more complete understating of the spatial and temporal patterns in biodiversity of the region. Functional trait diversity, such as diversity of trophic guilds, and size structure should be explored further.

The identification of important areas for functional groups may be more relevant to the identification of EBSAs than individual species since functional groups can be associated with important ecosystem processes.

Where sufficient relative distribution information does not exist, HSMs should be considered.

Additional analysis was required to delineate the current list of EBSAs. It was agreed that the meeting would be reconvened to review the analysis and finalize the SAR.

The Chairs thanked all the participants for a productive meeting and for their helpful comments and suggestions throughout. They specifically thanked the assessment team and reviewers for their contributions to the process. The meeting was adjourned.

OFFSHORE ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS -THE SCOTIAN SHELF BIOREGION (MARCH 24, 2014)

INTRODUCTION

The Chairs of the meeting, C. Whelan and K. Smedbol, welcomed participants (Appendix 1b) to the conclusion of the meeting to update offshore ecologically and biologically significant areas in the Scotian Shelf Bioregion.

Assessment

Presentation: Updating Offshore EBSAs in the Scotian Shelf Bioregion: Outstanding Issues

Presenter: M. King
Rapporteur: L. Bennett

Presentation Highlights

Results of additional analysis completed to revise the boundaries of a number of EBSAs were presented.

Discussion

LaHave Bank

The removal of LaHave Bank from the list of proposed EBSAs was recommended. The revised Browns Bank EBSA supports all of the same features identified within the proposed LaHave Bank EBSA.

Scotian Gulf

The proposed Scotian Gulf EBSA was combined with the Emerald Basin EBSA due to ecological (e.g., unique Russian Hat sponge community) and oceanographic linkages.

Emerald Basin

Revised boundaries to include Scotian Gulf and associated Russian Hat sponge concentrations were proposed. Revisions were accepted by meeting participants.

Jordan Basin

Due to bottom type, the top portion of the polygon was removed from the EBSA. The revised boundaries were accepted by meeting participants.

Northeast Channel

The proposed revised boundaries fell within the fan feature, which is considered unique due to its sediment. The revised boundaries were accepted by meeting participants.

It was recommended that the text should include a description of definitive boundaries versus those that are subject to more research and may be revised in the future.

Sable Island Shoal

Foraging distance from the island was used as the basis for the revised boundary. The boundary is also linked to chlorophyll concentrations, which is a key feature of the EBSA.

The revised boundary was accepted by meeting participants.

Stone Fence

The revised boundary focussed on the coral reef located within the EBSA and included a small buffer around the closure in case the closure area should change.

The revised boundary was accepted by meeting participants.

Laurentian Channel

Due it its small size, the boundary will require further refinement. It was suggested that the boundaries should be defined by the Scotian Shelf boundaries.

The current boundary was accepted by meeting participants.

CONCLUSIONS

For this meeting, a list of revisions to the boundaries of proposed EBSAs in the offshore Scotian Shelf Bioregion were presented and accepted by meeting participants.

A Science Advisory Report was completed, and it was agreed that the Working Paper would be produced as a CSAS Research Document.

The Chairs acknowledged and commended the assessment team for their efforts in preparation and presentation of the assessment.

REFERENCES CITED

CBD (Convention on Biological Diversity). 2009. Ninth meeting of the Conference of the Parties to the Convention on Biological Diversity, 19-30 May 2008 - Bonn, Germany. Marine and Coastal Biodiversity, (COP) 9, Decision IX/20.

DFO. 2004. Identification of Ecologically and Biologically Significant Areas. DFO Can. Sci. Advis. Sec. Ecosystem Status Rep. 2004/006.

DFO. 2006. Identification of Ecologically Significant Species and Community Properties. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/041.

DFO. 2012. Marine Protected Area Network Planning in the Scotian Shelf Bioregion: Objectives, Data, and Methods. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/064.

Doherty, P., and T. Horsman. 2007. Ecologically and Biologically Significant Areas of the Scotian Shelf and Environs: A Compilation of Scientific Expert Opinion. Can. Tech. Rep. Fish. Aquat. Sci. 2774:

Hastings, K., M. King, and K. Allard. 2014. Ecologically and Biologically Significant Areas in the Atlantic Coastal Region of Nova Scotia. Can. Tech. Rep. Fish. Aquat. Sci. 3107.

APPENDICES

APPENDIX 1A. LIST OF PARTICIPANTS: FEBRUARY 18-20, 2014.

Updating Offshore Ecologically and Biologically Significant Areas in the Scotian Shelf Bioregion

Maritimes Regional Science Advisory Process

Cambridge Suites Hotel
Halifax, Nova Scotia

February 18-20, 2014

Chairpersons: Christie Whelan and Kent Smedbol

ATTENDEES

Name	Affiliation
Aker, Jana	DFO Maritimes / Oceans and Coastal Management
Aldous, Don	Herring Science Council
Allard, Karel	Environment Canada / Canadian Wildlife Service
Bennett, Lottie	DFO Maritimes / Centre for Science Advice
Boerder, Kristina	Dalhousie University
Brickman, David	DFO Maritimes / Ocean and Ecosystem Sciences
Bundy, Alida	DFO Maritimes / Ocean and Environmental Science
Chapman, Bruce	Groundfish Enterprise Allocation Council
Clark, Don	DFO Maritimes / Population Ecology (SABS)
d'Entremont, Alain	Scotia Harvest Seafoods Inc. / O'Neil Fisheries Ltd.
Diz, Daniela	WWF-Canada, Atlantic Region
Doherty, Penny	DFO Maritimes / Regional Oceans Operations
Fenton, Derek	DFO Maritimes / Oceans and Coastal Management
Fuentes-Yaco, Cesar	DFO Maritimes / Population Ecology
Greenlaw, Michelle	DFO Maritimes / Coastal Ecosystem Science
Kenchington, Ellen*	DFO Maritimes / Oceans and Ecosystem Science
Kennedy, Eddy	DFO Maritimes / Coastal Ecosystem Science
King, Marty	DFO Maritimes / Oceans and Coastal Management
Large, Cory	DFO Maritimes / Policy and Economics
MacDonald, Elizabeth	Canada-NS Offshore Petroleum Board (CNSOPB)
Matthews, Jennifer	Canadian Assn. of Petroleum Producers (CAPP)
McNeely, Joshua	Maritime Aboriginal Peoples Council (MAPC) - IKANAWTIKET
Moors, Hilary	DFO Maritimes / Species at Risk Management
Pearo, Tricia	Fishermen and Scientists Research Society
Quigley, Sara	DFO Maritimes / Resource Management
Robinson, Tim	Fort Folly Habitat Recovery Program
Roff, John	formerly Acadia University / Canada Research
Schleit, Katie	Ecology Action Centre (EAC)
Serdynska, Anna	DFO Maritimes / Oceans & Coastal Management
Shackell, Nancy	DFO Maritimes / Oceans & Ecosystem Science
Silva, Angelica	DFO Maritimes / Population Ecology
Smedbol, Kent	DFO Maritimes / Oceans and Ecosystem Sciences
Sprague, Ashley	NS Dept. Fisheries and Aquaculture
Stewart, Dick	Full Bay Scallop Assoc. (FBSA) / Atlantic Herring Co-op

Name	Affiliation
Thillet, Marielle	Encana Corporation
Ward-Paige, Christine	DFO Maritimes / Ocean and Environmental Science
Westhead, Maxine	DFO Maritimes / Oceans and Coastal Management
Whelan, Christie	DFO Maritimes / Centre for Science Advice
Worm, Boris	Dalhousie University / Biology

*In attendance for the Coral and Sponges presentation only.

APPENDIX 1B. LIST OF PARTICIPANTS: MARCH 24, 2014.

Reconvened Updating Offshore Ecologically and Biologically Significant Areas in the Scotian Shelf Bioregion

Maritimes Regional Science Advisory Process

King Boardroom
Bedford Institute of Oceanography

March 24, 2014
(Reconvened from February 18-20, 2014)

Chairpersons: Christie Whelan and Kent Smedbol

ATTENDEES

Name	Affiliation
Aker, Jana	DFO Maritimes / Oceans and Coastal Management
Allard, Karel	Environment Canada / Canadian Wildlife Service
Bennett, Lottie	DFO Maritimes / Centre for Science Advice
Bundy, Alida	DFO Maritimes / Ocean and Environmental Science
d'Entremont, Alain	Scotia Harvest Seafoods Inc. / O'Neil Fisheries Ltd.
Fenton, Derek	DFO Maritimes / Oceans and Coastal Management
Greenlaw, Michelle	DFO Maritimes / Coastal Ecosystem Science
King, Marty	DFO Maritimes / Oceans and Coastal Management
McNeely, Joshua	Maritime Aboriginal Peoples Council (MAPC) - IKANAWTIKET
Pearo, Tricia	Fishermen and Scientists Research Society
Quigley, Sara	DFO Maritimes / Resource Management
Schleit, Katie	Ecology Action Centre (EAC)
Serdynska, Anna	DFO Maritimes / Oceans and Coastal Management
Shackell, Nancy	DFO Maritimes / Oceans and Ecosystem Science
Silva, Angelica	DFO Maritimes / Population Ecology
Smedbol, Kent	DFO Maritimes / Oceans and Ecosystem Sciences
Soomai, Suzuette	Dalhousie University / Information Management
Sprague, Ashley	NS Dept. Fisheries & Aquaculture
Thillet, Marielle	Encana Corporation
Ward-Paige, Christine	DFO Maritimes / Ocean & Environmental Science
Whelan, Christie	DFO Maritimes / Centre for Science Advice
Worcester, Tana	DFO Maritimes / Centre for Science Advice

APPENDIX 2. TERMS OF REFERENCE.

Updating Offshore Ecologically and Biologically Significant Areas in the Scotian Shelf Bioregion

Maritimes Regional Science Advisory Process

Cambridge Suites Hotel
Halifax, Nova Scotia

February 18-20, 2014

Chairpersons: Christie Whelan and Kent Smedbol

TERMS OF REFERENCE

Context

Canada's Oceans Act (1997) authorises Fisheries and Oceans Canada (DFO) to conserve and protect living aquatic resources and their supporting ecosystems through the creation of Marine Protected Areas (MPA) and MPA networks, and to provide enhanced management to areas of the oceans and coasts via the development of Integrated Oceans Management Plans. Ecologically and Biologically Significant Areas (EBSAs) are areas that warrant a greater-than-usual degree of risk aversion in the management of activities due to their particularly high ecological or biological significance (DFO 2011a). Identifying EBSAs is not a general strategy for protecting all species, habitats or communities that have some ecological significance (DFO 2004), but EBSAs will inform broader oceans planning and management processes and be considered in the design of bioregional MPA networks (DFO 2011b).

DFO has developed national guidance and criteria for the identification of EBSAs (DFO 2004, 2011a, 2011b) and Canada has endorsed the very similar scientific criteria of the Convention on Biological Diversity (CBD) (CBD 2009). Over the past decade, DFO has made considerable progress on identifying EBSAs in Canadian waters. The initial focus has been on the Department's five Large Ocean Management Areas (LOMAs) but EBSA identification efforts have started to expand beyond LOMAs.

In the Scotian Shelf Bioregion, which roughly corresponds to the DFO Maritimes Region boundary, there have been several efforts to identify EBSAs using a variety of approaches (e.g., Buzeta and Singh 2008; Doherty and Horsman 2007; Gromack et al. 2010; Maclean et al. 2009; Horsman et al. 2011). In March 2012, DFO Maritimes held a Regional Science Advisory Process (RAP) to develop initial advice on the ecological data and methods that should be considered in designing a network of MPAs in the bioregion. One of the recommendations was to re-evaluate the original offshore scientific expert opinion EBSAs described by Doherty and Horsman (2007). Updating the list of EBSAs for the Scotian Shelf Bioregion is also a specific deliverable under the *Health of the Oceans* initiative for the current fiscal year.

Objectives

The primary objective of this Science Advisory Process is to review and provide advice on an updated list of EBSAs for the offshore component of the Scotian Shelf Bioregion. The DFO EBSA criteria will be used as the primary basis for updating the EBSAs; however, the CBD criteria will also be considered.

The data and mapping methods used to develop individual data layers relevant to the DFO and CBD EBSA criteria for the offshore component of the Scotian Shelf Bioregion will also be presented. These EBSA data layers have been developed based on the guidance developed at the March 2012 RAP (DFO 2012). The meeting is intended to evaluate the scientific basis for

identifying certain areas as EBSAs and is not intended to evaluate management options for identified EBSAs.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document

Participation

- DFO Science
- DFO Ecosystem Management
- DFO Resource Management
- DFO Policy and Economics
- Other Government Departments
- Provincial Governments
- Aboriginal Groups
- Academics
- Non-government Organizations
- Fishing Industry
- Other Industry

References

Buzeta, M-I., and Singh, R. 2008. Identification of Ecologically and Biologically Significant Areas in the Bay of Fundy, Gulf of Maine. Volume 1: Areas Identified for Review, and Assessment of the Quoddy Region. Can. Tech. Rep. Fish. Aquat. Sci. 2788: vii + 80 p.

CBD (Convention on Biological Diversity). 2009. Ninth Meeting of the Conference of the Parties to the Convention on Biological Diversity, 19-30 May 2008 - Bonn, Germany. Marine and Coastal Biodiversity, (COP) 9, Decision IX/20.

DFO, 2004. Identification of Ecologically and Biologically Significant Areas. DFO Can. Sci. Advis. Sec. Ecosystem Status Rep. 2004/006.

DFO, 2006. Identification of Ecologically Significant Species and Community Properties. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/041.

DFO, 2007. Guidance Document on Identifying Conservation Priorities and Phrasing Conservation Objectives for Large Ocean Management Areas. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/010.

DFO. 2008. Further Guidance on the Formulation, Prioritization, and Use of Conservation Objectives in an Ecosystem Approach to Integrated Management of Human Activities in Aquatic Ecosystems. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2008/029.

DFO. 2010. Science Guidance on the Development of Networks of Marine Protected Areas (MPAs). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/061.

DFO. 2011a. Ecologically and Biologically Significant Areas – Lessons Learned. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2011/049.

DFO. 2011b. National Framework for Canada's Network of MPAs. Fisheries and Oceans Canada, Ottawa. 31pp.

DFO. 2012. Marine Protected Area Network Planning in the Scotian Shelf Bioregion: Objectives, Data, and Methods. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/064.

DFO. 2013a. Guidance on the Formulation of Conservation Objectives and Identification of Indicators, Monitoring Protocols and Strategies for Bioregional Marine Protected Area Networks. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/081.

DFO. 2013b. Science Guidance on how to Achieve Representativity in the Design of Marine Protected Area Networks. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/083.

Doherty, P., and T. Horsman. 2007. Ecologically and Biologically Significant Areas of the Scotian Shelf and Environs: A Compilation of Scientific Expert Opinion. Can. Tech. Rep. Fish. Aquat. Sci. 2774: 57 + xii pp.

Gromack, A.G., Allard, K., Fenton, D., Johnston, S., and Ford, J. 2010. Ecological and Human use Information for Twenty Areas on the Atlantic Coast of Nova Scotia in Support of Conservation Planning. Can. Tech. Rep. Fish. Aquat. Sci. 2880: xiv + 226 p.

Horsman, T.L., Serdynska, A., Zwanenburg, K.C.T., and Shackell, N.L. 2011. Report on the Marine Protected Area Network Analysis in the Maritimes Region, Canada. Can. Tech. Rep. Fish. Aquat. Sci. 2917: xi + 188 p.

Maclean, M., Breeze, H., and Doherty, P. 2009. Using Fish Harvesters Local Ecological Knowledge (LEK) in Support of Identifying Ecologically and Biologically Significant Areas on the Offshore Eastern Scotian Shelf. Oceans and Habitat Report 2009-01. Oceans and Coastal Management Branch, Fisheries and Oceans Canada, Dartmouth, NS, Canada: iv + 49 p.

IMPORTANT NOTICE AND DISCLAIMER: This page contains links to non-Government of Canada Web sites. For more information on the DFO's hyperlinking practices, please refer to the Hyperlinking section of the Important Notices at the bottom of this page.

APPENDIX 3. AGENDA: FEBRUARY 18-20, 2014.

Updating Offshore Ecologically and Biologically Significant Areas in the Scotian Shelf Bioregion

Maritimes Regional Science Advisory Process

Cambridge Suites Hotel
Halifax, Nova Scotia

February 18-20, 2014

Chairpersons: Christie Whelan and Kent Smedbol

DRAFT AGENDA

Day One (February 18th)

09:00 – Introductions and Review Agenda (Co-Chairs: Christie Whelan and Kent Smedbol)

09:30 – Meeting Objectives and Context (Marty King)

10:30 – Break

10:45 – Approach used to evaluate and update EBSAs (Marty King)

11:15 - Benthic EBSAs and an update on mapping coral and sponge distribution in the Maritimes Region (Ellen Kenchington)

12:00 – Lunch

13:00 – Mapping areas of high phytoplankton biomass in the offshore component of the Scotian Shelf Bioregion: a remotely-sensed approach (César Fuentes-Yaco)

13:45 – Modeling cetacean distribution in the Scotian Shelf Bioregion (Hilary Moors)

14:30 – Break

14:45 – Mapping areas of high fish and invertebrate biomass (Marty King and Anna Serdynska)

15:15 – Mapping important habitat for demersal fishes and macro-invertebrates (Marty King and Anna Serdynska)

15:45 – Review SAR text

16:30 – Wrap Up

Day Two (February 19th)

09:00 – Review of Day One

09:30 – Important offshore habitats for seabirds (Karel Allard)

10:30 – Break

10:45 – Mapping areas of high biodiversity in the Scotian Shelf Bioregion (Christine Ward-Paige and Alida Bundy)

12:00 – Lunch

13:00 – Review updated EBSAs for the offshore component of the Scotian Shelf Bioregion (Jana Aker, Derek Fenton, and Marty King)

14:30 – Break

14:45 – Review updated EBSAs (continued)

16:00 – Review SAR text

16:30 – Wrap up

Day Three (February 20th)

09:00 – Review of Day Two

09:30 – Review updated EBSAs (continued) (Jiania Aker, Derek Fenton, and Marty King)

10:30 – Break

10:45 – Review updated EBSAs (continued) (Jiania Aker, Derek Fenton, and Marty King)

12:00 – Lunch

13:00 – Review of SAR

14:30 – Break

14:45 – Review of SAR (continued)

16:00 – Wrap up